APPENDIX G

INTERFACE CONTROL DOCUMENT

FOR

MODULATOR DOPPLER PREDICTOR − SUBSYSTEM CONTROLLER / USS ADPE STATUS AND CONTROL 1553B INTERFACE

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SECTION G1
INTRODUCTION

G1.1 PURPOSE

The purpose of this document is to provide a detailed definition of the interface between the Modulator Doppler Predictor (MDP) and the USS Subsystem Controller (SSC)/USS ADPE.

G1.2 SCOPE

This Interface Control Document (ICD) defines and controls the applications functions, communications protocol, messages, message formats, and the electrical and mechanical characteristics of the interface between the MDP and the USS SSC/ADPE.

SECTION G2
APPLICABLE DOCUMENTS

G2.1 GENERAL

The following documents, are part of this specification to the extent cited herein.

G2.2 SPECIFICATIONS

STGT - HE - 06 - 01, 9/90	HW/SW Interface Document

G2.3 STANDARDS

MIL - STD - 1553B 9/86 through Notice 2	Aircraft Internal Time Division Command/Response Multiplex Data Bus

SECTION G3
SYSTEM DESCRIPTIONS

G3.1 GENERAL

This section provides background information on the functions of the MDP and its support role in user services.

G3.2 MODULATOR DOPPLER PREDICTOR DESCRIPTION

G3.2.1 FUNCTIONAL OVERVIEW

The MDP provides forward modulation, carrier and code Doppler Compensation, and carrier sweep for all S - band Single Access (SSA), K - band Single Access (KSA), and Multiple Access (MA) forward user services.The essential functions of this unit are:

a. Data formatting and encoding of forward data.

b. Generation of range and command PN codes, when required.

c. PSK modulation of the forward carrier with forward data and PN codes, when required.

d. Doppler compensation of forward carrier and PN code rate, including the ability to compensate carrier and code dependently or independently.

e. Carrier sweep to assist acquisition of the forward link, when required.

f. Generation of status data, including self test and fault isolation.

g. Generation of test signals, including an unmodulated IF carrier output.

Figure G3 - 1 shows the MDP Functional Block Diagram

G3.2.2 (NOT USED)

G3.2.3 LRU DESCRIPTIONS

a. MODEM CONTROL PROCESSOR (MCP) LRU

The Modem Control Processor is a 25 MHz 68030 processor based VME bus controller with 68882 floating point co - processor, 1 MB zero wait state static RAM, and four EPROM sockets.

b. DATA CONDITIONING AND ENCODING (DCEC) LRU

The DCEC performs data conditioning, encoding, and PN modulation for the MDP. This includes data format conversion, convolutional encoding, symbol clock synchronization with data clock, symbol format conversion, PN spreading, clock detection, and data presence check.

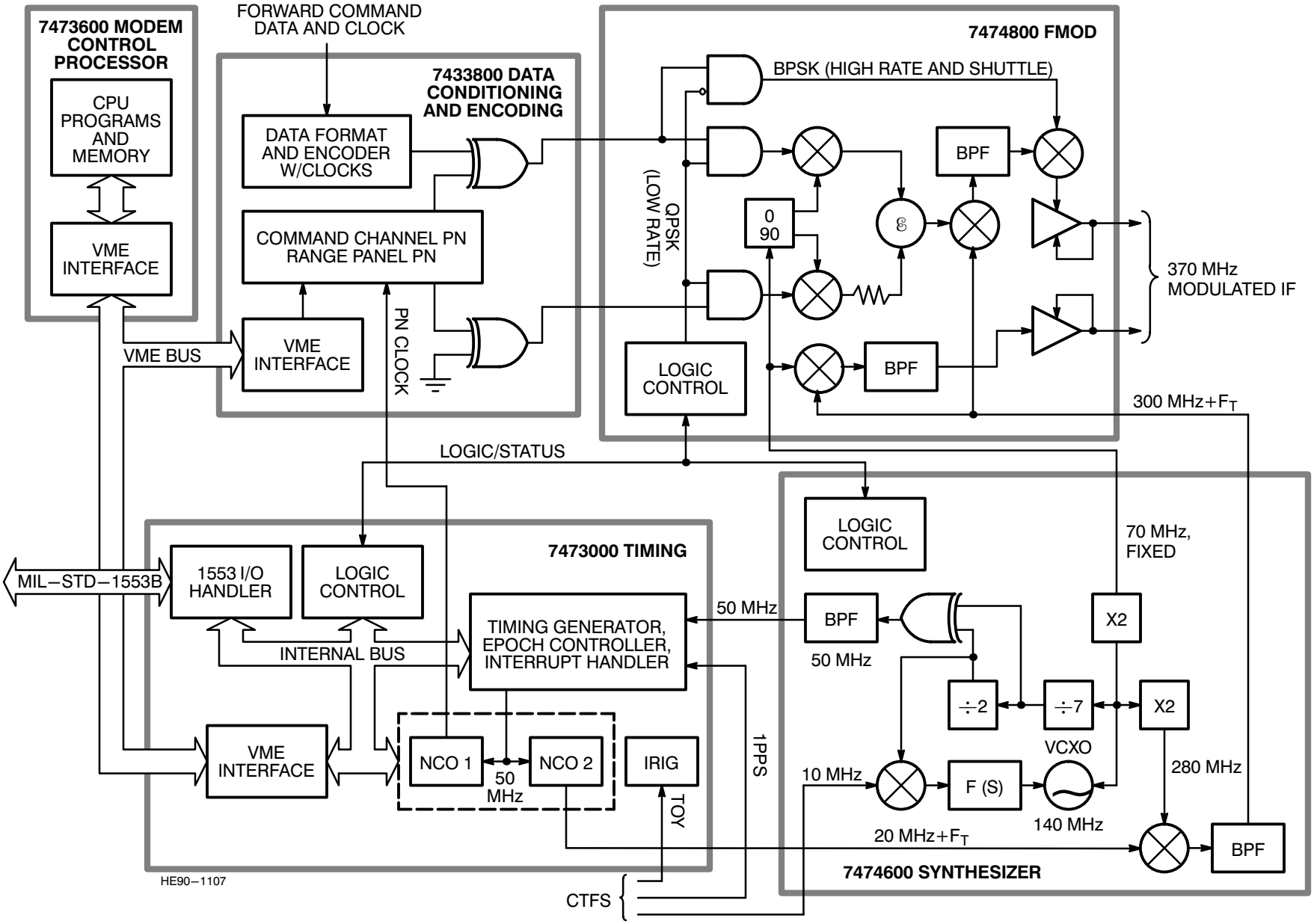

Figure G3−1. Modulator/Doppler Predictor (MDP) General Block Diagram

c. TIMING GENERATOR (TIME) LRU

The Timing Generator:

1. Provides Time of year data (seconds, minutes, hours, and days) from the input serial IRIG - B data
2. Provides a microprocessor controlled 1553 interface
3. Provides timing and epoch interrupts from the 1 PPS, Epoch, and 50 MHz signals and accept masking of any or all of these interrupts
4. Provides an epoch count
5. Provides two Numerically Controller Oscillators adjustable by microprocessor control
6. Provides Control/Status communication between the RF modules and the MCP
7. Provides an analog voltage measurement of various power sources upon microprocessor command

d. SYNTHESIZER (SYNTH) LRU

The SYNTH LRU uses the externally provided 10 MHz frequency reference signal to provide all of the clocks required by the modules of the IR.

e. FORWARD MODULATOR (FMOD) LRU

The FMOD performs both BPSK and QPSK modulation of command range channel data.

f. POWER SUPPLY NO. 1 (PS1)

PS1 supplies $\pm$15 volts, +5 volts for logic, and separate +5 volts for RF to the following modules:

FMOD	DCEC
SYNTH	MCP
TIME	

g. POWER SUPPLY NO. 2 (PS2)

PS2 supplies - 5.2 volts and $\pm$12 volts to the following modules:

FMOD	TIME
SYNTH	MCP

G3.2.4 CRITICAL PERFORMANCE STATUS DESCRIPTION (TBD)

a. PN State

b. Time Transfer Measurements

c. User Data Activity Status

G3.2.5 BUILT–IN TEST OVERVIEW

a. CONFIDENCE TEST

Confidence BIT - LRUs Tested: MCP, DCEC, TIME, POWER SUPPLIES, TEMP. This function consists of the following test groups:

1. Test CPU
2. Test VME
3. Test Environment
4. Test RAM
5. Test 1553
6. Test Indicators

The Confidence BIT is executed upon power up or upon command via the 1553.

b. ONLINE TEST

Online BIT - LRUs Tested: FMOD, SYNTH, TIME, POWER SUPPLIES, TEMP, MCP. This function consists of the following BIT functions. Online BIT is a continuous process that is run on all active MDP states, which includes:

1. Monitor ALC Levels
2. Monitor Synth Lock
3. Monitor 1PPS
4. Monitor Environment
5. Monitor Time
6. Monitor Exceptions

c. EXTENDED BIT TESTS

1. Test VME

LRUs tested - DCEC, TIME

Pass/Fail Criteria - The VME test will pass if each VME LRU can be written to and/or read from without error. If a write/read error is detected with any of the VME LRUs, this test will fail.

This VME test subprocess verifies operation of the VME data transfer bus. A test data word is written to and/or read from each of the VME slave LRUs, as listed under “LRUs Tested”. If a bus exception occurs during LRU access, this test will fail. On those LRUs that have a write/read capability, a test word written to the LRU is compared to the test word read from the LRU. If the test data words do not compare, this VME bus test will fail.

2. TEST TIME

LRUs tested - TIME

Pass/Fail Criteria - The TIME test will pass if each of its four timing interrupts (1, 10, 100, and 1000 PPS) occur within a reasonable tolerance, and the 5V reference is within a reasonable tolerance. Otherwise, if any of these measurements are out of tolerance, this test will fail. Also, if resynchronization is in progress and no external 1PPS signal is present this test will fail due to lack of time interrupts.

This test verifies the following functions of the TIME LRU:

Timing interrupts

A/D converter

The intervals of each of the TIME LRUs timing interrupts are measured by a PIT counter and verified to be within a reasonable percentage of the nominal time period.

The reference 6.2V input to the TIME LRUs A/D converter is converted to a digital representation and verified to be within a reasonable percentage of nominal 6.2V.

3. TEST MCP

LRUs tested - MCP, TIME

Pass/Fail Criteria - The MCP test will pass if each MCP subtest passes. If any of the MCP subtests fail, the MCP test will also fail.

This MCP test subprocess consists of the following subtests:

68030 TEST
PIT TEST

MCP Subtest Descriptions:

68030 TEST - This subtest verifies operation of the 68030 MCP processor. The 68030 functions tested include the following:

Internal register operation
Addressing modes
Instruction set operation
Exception processing

This subtest will fail if any of the tested functions are not operating as expected.

PIT TEST - This subtest verifies operation of the two MCP PITS. This subtest tests the PIT's registers, timers, and interrupts. The registers are tested by writing and reading a test word to/from each register and verifying that the word read from the register is the

same as the word written to the register. The two PIT timers are tested by comparing their measurement of a short period of time. This subtest will fail if a register data write/read is inconsistent, or if the PIT timers do not measure a period of time within +/ - 5 percent of each other, or if the PIT interrupts do not occur.

4. TEST DCEC

LRUs tested - DCEC, TIME

Pass/Fail Criteria - This DEC test will pass if the DCEC status and signature test results are as expected. Otherwise, if its status or signature test results are not the expected values, this DCEC test will fail.

This test configures the DCEC for a signature test. The modulated output data from the signature test is compared with expected values and the DCEC status verified.

SECTION G4
INTERFACE CONFIGURATION AND CONTROL

Figure G4 - 1 illustrates the configuration of the MDP - SSC/ADPE interface and the interactions that are defined. The MDP and the USS ADPE interact directly at the user levels (interactions 1 through 3). The SSC provides the interfacing medium for the transport service levels (interactions 4 through 13). Requirements allocations for each of the 14 interactions are shown in Table G4 - 1.

TABLE G4—1. REQUIREMENTS ALLOCATION

Interaction Number	UNIT		
	MDP	**SSC**	**ADPE**
1	X		X
2	X		X
3	X		X
4	X	X	
5		X	X
6	X	X	
7	X	X	
8 - 13		X	X
14		X	X

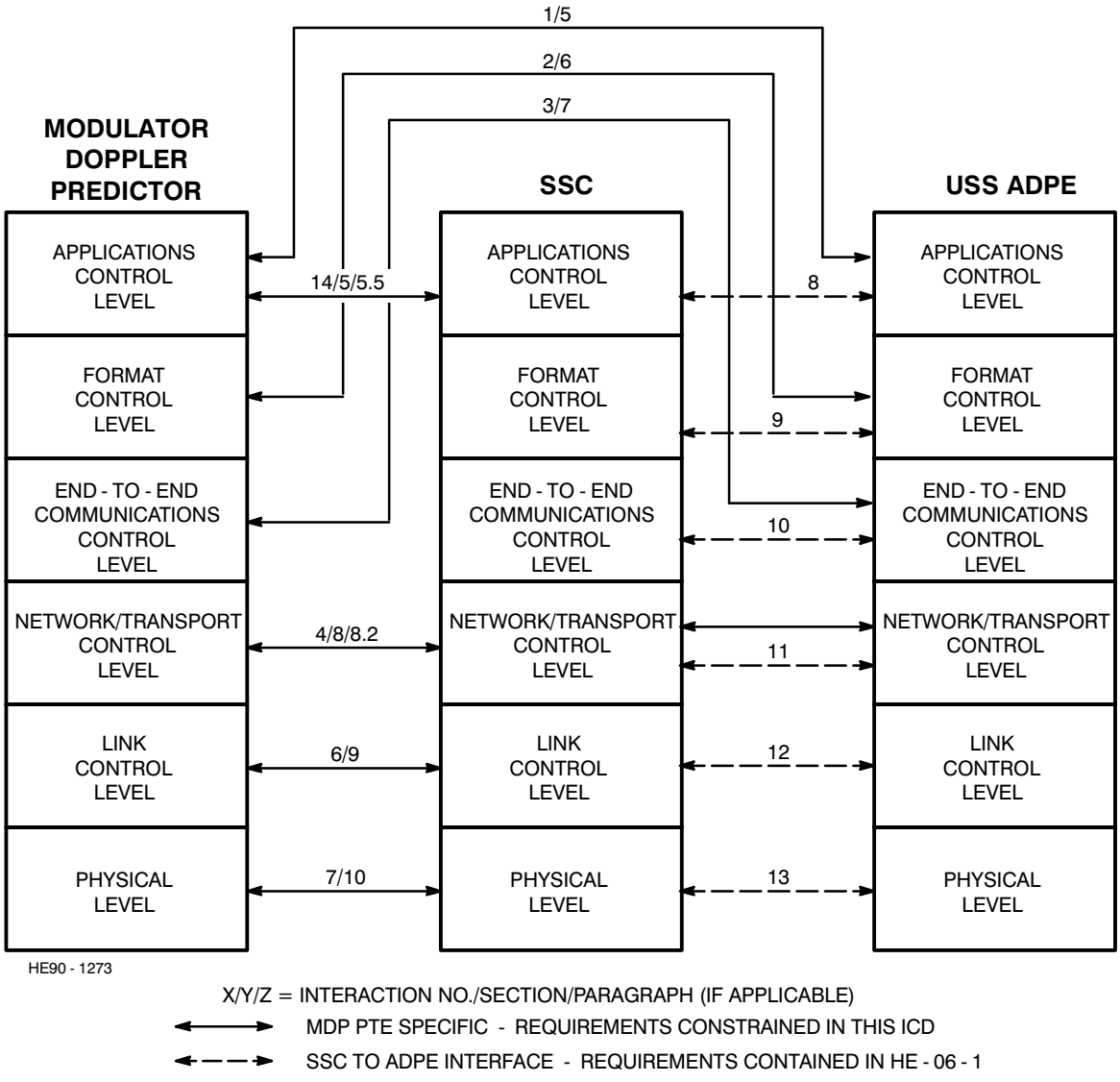

Figure G4—1. MDP — SSC/ADPE Interface

SECTION G5
APPLICATIONS CONTROL LEVEL

G5.1 GENERAL

This section describes the MDP - SSC/ADPE interface at the Applications Control Level (interaction 1 of Figure G4 - 1).

G5.2 MDP COMMANDING

G5.2.1 TIME DEFINITIONS

Effective Time shall be defined as the exact 1pps time that command execution shall initiate for synchronous commands.

Execution Time shall be defined as the maximum time that a command takes to complete its function.

Setup Time shall be defined as the maximum time required to prepare for execution of a synchronous commands.

Initiation Time shall be defined as the Effective Time for synchronous commands, and the actual implementation time for asynchronous commands.

G5.2.2 SYNCHRONOUS COMMANDS

Synchronous commands shall be defined as commands which contain an effective time, so that command execution may be time synchronized with other units.

Table 5 - 1 shows the setup and execution time for each of the commands.

The effective time shall take place on the 1 pps of the time specified in the time field of the command. The execution time shall be measured from the effective time. For commands that are to be completed and latched at the 1 pps, execution time is specified as zero. Setup time is defined as 1 second for all synchronous commands. Figure G5 - 1 shows a pictorial representation of these times.

The unit is not required to execute more than one synchronous command per effective time.

For synchronous commands that involve frequency control, the ADPE will not activate more than one altered profile command at a time. For example, commands to break lock will not be sent during a frequency sweep. Control commands are active during the time between the EFFECTIVE TIME and EFFECTIVE TIME + DURATION.

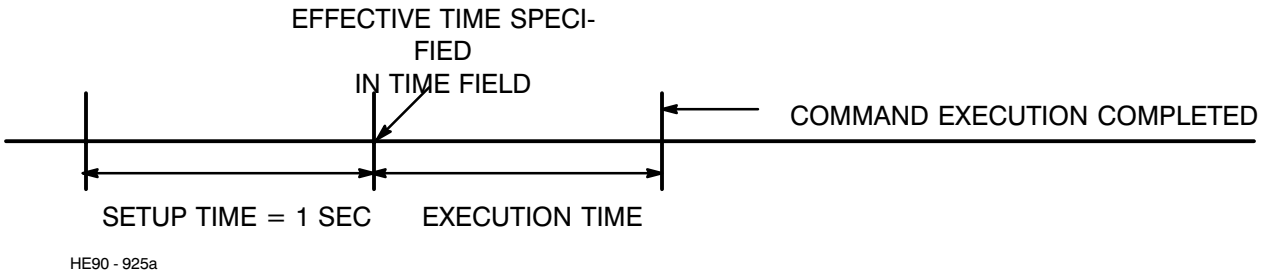

Figure G5—1. Time Definition

G5.2.3 ASYNCHRONOUS COMMANDS

Asynchronous commands are defined as commands that do not contain an effective time. They are executed as soon as possible from time of receipt, such that the maximum execution time allowed for completion of the command does not exceed the execution time specified in Table G5 - 1.

TABLE G5—1. SETUP AND EXECUTION TIMES

Command		MDP	
	Sync/ Async	Setup Time (in seconds)	Execution Time (in seconds)
Set State	A	N/A	1
Common Config	A	N/A	1
Specific Config MDP	A	N/A	1
MDP Start Service	S	1	0
Forward Freq Sweep	S	1	120
Forward Doppler Compensation Control	S	1	var
Forward Break Lock	S	1	var
Download - Note 1			
Ephemeris Data - Note 1			

NOTES:

1. Timing definitions are specified in paragraph 5.4

The execution time for an asynchronous command shall be specified from time of receipt at the unit.

The **maximum command rate** (maximum commands per second) for any given asynchronous command is defined as 1/Execution Time. Should this rate be exceeded, the unit shall not malfunction or lock - up. The unit may overwrite the previous command of the same type.

No more than 4 asynchronous commands may be sent to the unit in any 1 second period.

G5.2.4 MDP COMMAND AND OPERATING STATES

G5.2.4.1 General

The MDP operating states consist of 6 major states. These states are described in the following paragraphs.

G5.2.4.2 State Descriptions

Commands shall be accepted or executed in the states indicated in Table G5 - 2a. Table G5 - 2b shows the State Transition Table (STT) in terms of events and actions. Figure G5 - 2 shows a simplified state transition diagram.

Confidence Test in Progress - This state shall be entered upon power - up or reset. During this state, the MDP will be executing its confidence test, and will not respond over the 1553b interface. This state will complete in less than 10 seconds. During this state, the TEST LED on the front panel will be set. If the confidence test fails, the FAULT LED on the front panel will be set.

Standby - This state shall be entered by completion of the confidence test, or by command via the 1553b interface. This state indicates that the MDP is ready to receive a configuration command. Upon receipt of both a COMMON CONFIGURATION COMMAND and a SPECIFIC CONFIGURATION COMMAND, the MDP shall start configuration of the unit. Upon receipt of an Extended BIT command, the MDP shall begin automatic BIT.

Extended BIT - This state shall be entered by an Extended BIT command from either front panel or 1553b, and shall exit either upon completion of the BIT or by termination of BIT by either front panel or 1553b command.

Configuration In Progress - This state shall indicate that the MDP is dedicated to the configuration of the unit. No other signal modulation or control will be done while in this state. The MDP is configured as per the specific and common configuration commands received via the 1553b interface. Upon completion of the configuration, the unit transitions to the state as described in the MDP STD. This state will complete in less than 1 second.

Configured - This state shall indicate that the MDP has received the COMMON CONFIGURATION COMMAND and is ready to accept the START SERVICE COMMAND.

TABLE G5—2a. MDP COMMAND STATE TABLE

Command \ State	Sync/ Async	Confidence Test	Extended Bit	Standby	Config—ured	Config. in Progress	In Service
Set State Command	A						
- Reset			X	X	X	X	X
- Clear Ephem				X	X	X	X
- Clear Config				X	X	X	X
- Clear Both				X	X	X	X
- Start Extended BIT				X	X	X	X
- Stop Extended BIT			X				
Download (F/W)	N/A			X			
Download (Ephemeris)	N/A			X	X	X	X
Specific Config. Cmd	A			X	X	X	X
Common Config. Cmd	A			X	X	X	X
Start Service	S				X		X
FWD Freq Sweep	S						X
FWD Doppler Ctrl	S						X
FWD Break Lock	S						X

In Service - This state shall indicate that the MDP has received the START SERVICE COMMAND and has started modulation.

G5.2.5 (NOT USED)

G5.2.6 (NOT USED)

G5.2.7 COMMAND MEMORY

The MDP shall provide a memory capability for the SPECIFIC and COMMON configuration commands. This will allow a null command (no bits set in the BIT MAP) to be sent to transition from one state to the next, provided the applicable data were supplied during a previous command transmission. The MDP shall use the data from this last transmission to perform any necessary configurations. A null command is always treated as a RESTART configuration.

TABLE G5—2b. MDP STATE TRANSITION TABLE

Current State	Event	Action	Next State
POWER OFF	Power - On	Boot Exec and Application Execute Confidence Test	CONFIDENCE TEST IN PROGRESS
CONFIDENCE TEST IN PROGRESS	Test Complete	BIT status updated	STANDBY
Any State	SET_STATE - Reset	Boot Exec and Application Execute Confidence Test	CONFIDENCE TEST IN PROGRESS
Any State except EXTENDED BIT	SET_STATE - Standby	Clear Config, Ephem, or Both	STANDBY
	SET_STATE - Run Extended BIT	Run extended BIT	EXTENDED BIT (Goto STANDBY when complete)
EXTENDED BIT	SET_STATE - Halt Extended BIT or completion	Stop extended BIT Place results in status	STANDBY
STANDBY	COMMON_CONFIG and SPECIFIC_CONFIG	Start Configuration	CONFIGURED (via config in prog)
CONFIGURATION IN PROGRESS (From Standby)	Configuration Complete	None	CONFIGURED
CONFIGURED	START_SERVICE	Initialize PN epoch	IN SERVICE
	COMMON_CONFIG	Configure	CONFIGURED
	SPECIFIC_CONFIG	Configure	CONFIGURED
IN SERVICE	FWD_FREQ_SWEEP	Initiate Fwd Sweep	IN SERVICE
	FWD_DOP_COMP_CTL	Initiate Dopp Freq Ramp	IN SERVICE
	FWD_BREAK_LOCK	Initiate Fwd Break Lock	IN SERVICE
	COMMON_CONFIG (restart)	Stop modulation - Reconfig	CONFIGURED (via config in prog)
	COMMON_CONFIG (recovery)	Continue Modulating - Reconfigure in Background	IN SERVICE
	SPECIFIC_CONFIG (restart)	Stop modulation - Reconfig	CONFIGURED (via config in prog)
	SPECIFIC_CONFIG (recovery)	Continue Modulating - Reconfigure in Background	IN SERVICE
	START_SERVICE	Reinitialize PN Epoch	IN SERVICE

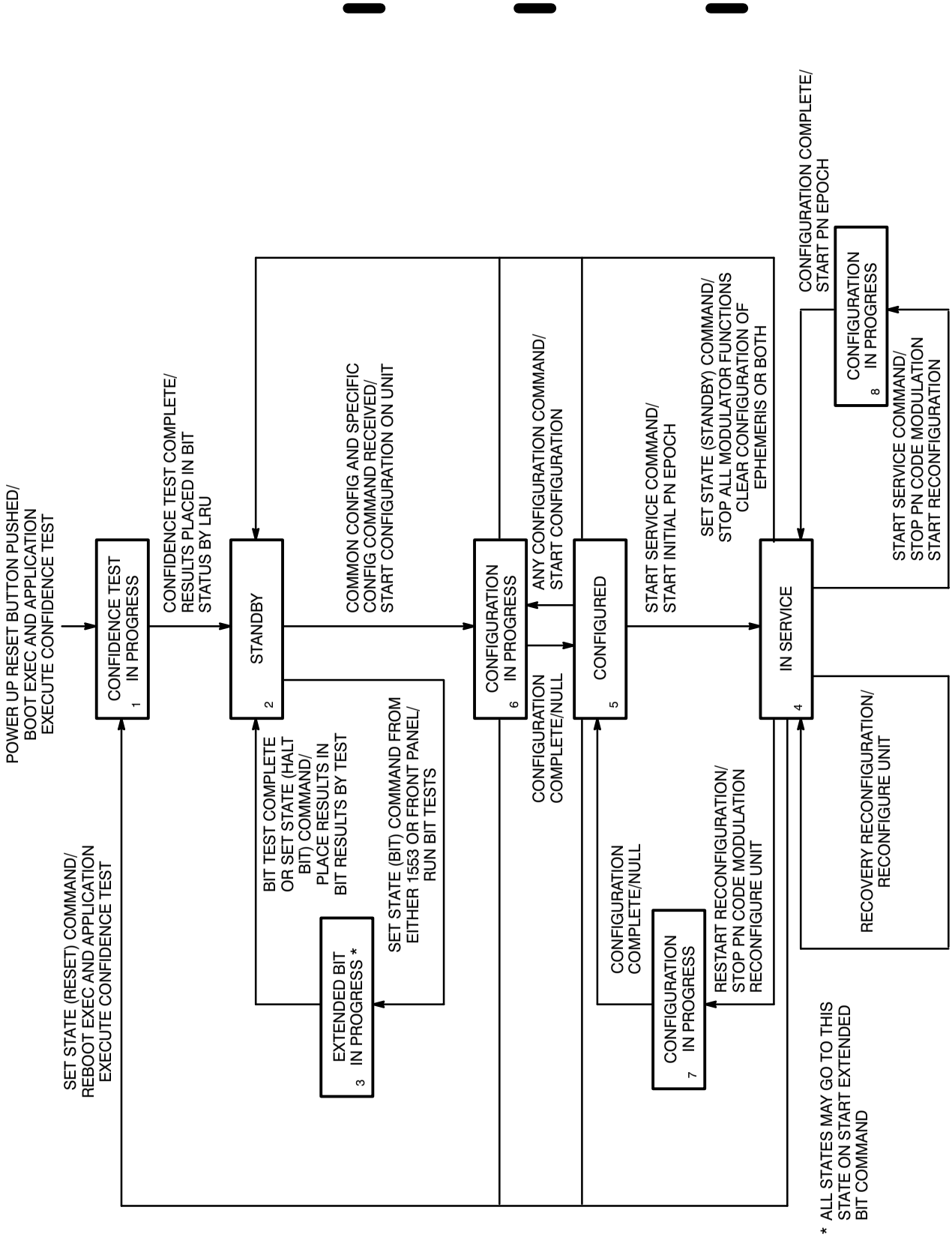

Figure G5−2. MDP State Transition Diagram

G5.2.8 CONFIGURATION DATA REQUIREMENTS BY SERVICE TYPE

Transition from the STANDBY state to the CONFIGURED state, a minimum set of data shall be required, based on SERVICE TYPE. All command data parameters from the COMMON and SPECIFIC CONFIGURATION COMMAND shall be required to transition to CONFIGURED except OPERATIONAL LIGHT for all services, and NOMINAL SHUTTLE PN RATE for non - shuttle services (SSAF, KSAF, and MAF).

G5.3 MDP STATUS REPORTING AND TIME—TAGGING

Status shall be collected and reported once per second and time tagged to a 1 pps mark. Status reports time tagged "t_0" shall contain:

Integrated Status - Integrated status over the time period (t_0 - 1) to t_0. This includes lock status and doppler frequency status.

Snapshot Status - Status sampled at the 1pps reflecting equipment state or a measurement at the instant t_0. This shall include status that reflects a synchronous command with an effective time of t_0, as well as status that reflects an asynchronous which took effect within the previous second.

Time Transfer Status - Measurements of first PN epoch relative to 1pps at t_0 - 1.

Status reports time tagged "t_0" shall be available for collection by the subsystem controller throughout the interval

(t_0 + 300ms) to (t_0 + 1 second).

Extended BIT Status shall be available from 300 ms of the 1 pps interval immediately following completion of the BIT, until start of the next Extended BIT.

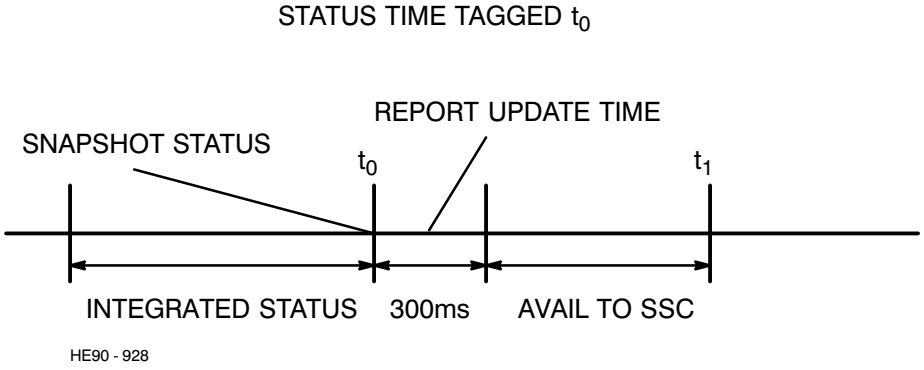

Figure G5—3. Status Reporting

G5.4 EPHEMERIS DOWNLOADING

a. The term “Ephemeris” shall be used to refer to frequency profiles provided to the MDP, for the purpose of this ICD.

b. The Download Command shall always precede the Ephemeris Data Command. The time spacing between these commands shall be limited only by the 1553b rate.

c. Ephemeris downloading shall follow a “2 - 10 - 2” rule.

   2 - 10 - 2 Rule:

   Ephemeris data shall be required **two seconds in advance** of its use and received at a rate **not to exceed ten minutes** of ephemeris data **in any two second period**.

   The ADPE shall ensure sufficient timing margins to compensate for any timing uncertainties, so that the above requirements are met.

   Ephemeris processing requires up to ten seconds starting from the completion of an ephemeris data download. If processing takes longer, the unit shall use the first point that it can as a safeguard. The unit will use the data from the previous download until it is ready to switch to the data in the new download. The unit shall use the first point in the new download that it can. If no ephemeris data has been downloaded, the unit shall assume zero doppler.

d. Commands may be received during ephemeris data download.

e. Ephemeris data shall be rejected if time of the first data point is greater than 60 minutes into the future.

f. If, at any time, the MDP runs out of valid ephemeris data, it shall continue using its last valid data point, until new ephemeris data are supplied.

G5.5 SUBSYSTEM CONTROLLER STATUS COLLECTION

Upon receipt of the 1PPS epoch command from the ADPE, the SSC shall initiate a delay of 300 ms prior to collecting the MDP status when MDP tables have been selected by the ADPE. The status shall be collected within a 550 ms window following the delay, which will be reported to ADPE upon receipt of the next transmit status command. Figure G5 - 4 shows a timeline of the status collection process.

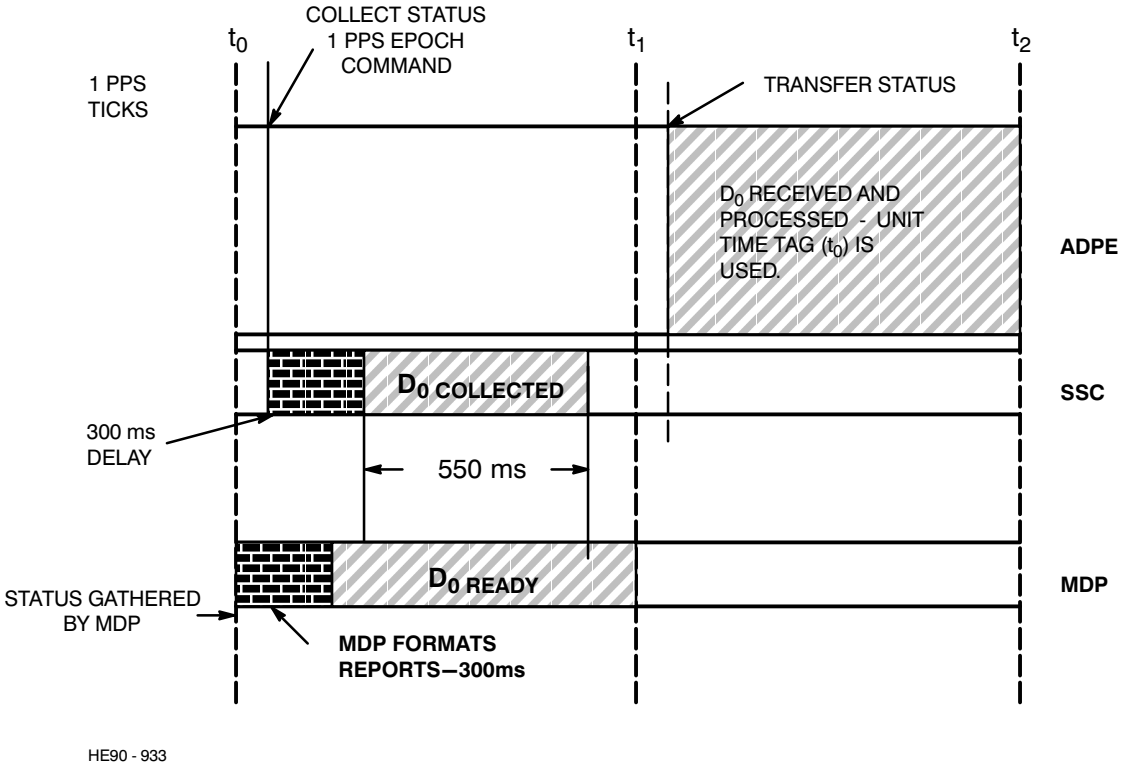

Figure G5—4. SSC—MDP Status Collection Window

SECTION G6
FORMAT CONTROL LEVEL

G6.1 GENERAL

This section describes the Format Control Level interactions of the MDP - SSC/ADPE interface (interaction 2 of Figure G4 - 1).

G6.2 MESSAGE FORMATS

G6.2.1 FORMAT STRUCTURE

All message formats between the MDP and the SSC/ADPE shall contain a Start Checkword and an End Checkword as shown in each message. In addition, all message lengths shall contain an even number of bytes, less than or equal to 64, so that the message format may conform to a 1553 data transfer as one data block. The exception is ephemeris data which may be sent in as many blocks and bytes as necessary, up to 9606 words.

G6.2.2 COMMAND FIELD DEFINITIONS

The command format is defined by the contents of the command fields shown below.

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION

These fields are defined as follows:

BYTE # specifies the byte number(s) of the associated command parameter, relative to its position in the command. Where a parameter is defined over several bytes, the leftmost, lowest numbered byte contains the MSB (most significant bit).

BIT #S specifies the bit numbers within the byte(s) of the associated parameter. Bit 0 is always the LSB.

TYPE specifies the data representation.

Three data types are used in this ICD. These consist of:

BIN - Binary indicates that the data specified in the field will be in a binary format, with the LSB specified in the resolution field. All negative numbers shall be represented in binary 2's compliment format. The range field for binary is specified in decimal.

HEX - HEX is used to specify that the range field has been specified in HEX. This has been used to specify the Start and End Checkwords.

OCT - Octal is used for PN codes to indicate that the range as well as the data is to be read and transferred in an octal format, where each digit is represented by three bits.

RANGE specifies the range of allowable values that a parameter may take on. The range for BINARY types are specified in decimal, HEX is in hex, and OCT is in octal. The range is described in terms of the units, unless otherwise specified.

UNITS define the units of measurement of this parameter.

RESOLUTION specifies the value of the LSB for the associated parameter. Unless otherwise specified, the resolution is in terms of the units.

DESCRIPTION provides the name of the parameter (in bold face capital letters), any subparameters (in non - bold face capital letters), and a description of that parameter.

G6.2.3 STATUS FIELD DEFINITIONS

The status fields are identical to the command fields, except that an additional field, ACCURACY, is provided.

ACCURACY specifies the accuracy of a measurement, with respect to its resolution. Accuracy does not impose requirements on the MDP but reflects actual design.

G6.2.4 RESERVED FIELDS

Fields marked “Reserved” are for IEC use or to preserve commonality of “inter - unit commands” only and should be set to zero. These fields shall not be considered spares. Fields labeled as “Spare” are available for future use.

G6.3 MDP COMMANDS

SUMMARY OF MODULATOR / DOPPLER PREDICTOR (MDP) COMMANDS:

MDP_SET_STATE_COMMAND
MDP_SPECIFIC_CONFIGURATION_COMMAND
MDP_COMMON_CONFIGURATION_COMMAND
MDP_FWD_BREAK_LOCK
MDP_FWD_DOPPLER_COMP_CONTROL
MDP_FWD_FREQUENCY_SWEEP_COMMAND
MDP_START_SERVICE_COMMAND
MDP_DOWNLOAD_COMMAND
MDP_EPHEMERIS_DATA_COMMAND

MDP_SET_STATE_COMMAND

Description:

Type: Asynchronous

Used to reset unit, put unit into standby, run extended BIT, and halt extended BIT. When put into standby, this command can be setup to clear ephemeris, configuration, or both.

Command Verification: None

Format:

MDP_SET_STATE_COMMAND (CONT)

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	N/A	N/A	N/A	**SPARE**
4	7 - 0	BIN	1 TO 4	N/A	N/A	**INITIALIZATION TYPE:** 1 = RESET MDP will perform reboot & confidence test 2 = STANDBY Puts MDP in standby state. 3 = RUN EXTENDED BIT Run a sequence of BIT tests whose results will be made available via the Extended BIT report. 4 = HALT EXTENDED BIT Halts upon completion of current test. To do and immediate halt, use RESET.
5,6	15 - 0	BIN	0 TO 3	N/A	N/A	**INITIALIZATION DATA:** Compliments initialization type as follows: 0 = N/A (Use when data initialization type is not standby. 1 = STANDBY CLEAR EPHEMERIS Clears out any ephemeris data previously sent and initializes ephemeris related data for receipt of new data. 2 = STANDBY CLEAR CONFIGURATION Clears out any configuration data previously sent and initializes configuration related data for receipt of new config. data 3 = STANDBY CLEAR CONFIG and EPHEMERIS Executes both the Clear Ephemeris and Clear Configuration above.
7,8	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_SPECIFIC_CONFIGURATION_COMMAND

Description:

Type: Asynchronous

This configuration command contains configuration items that are specific to the MDP (not common or synchronous to the MDP or PTE). This command is used for initial configuration or reconfiguration of the MDP. The MDP reads only the parameters demarcated in the configuration bit map. All others are ignored.

The MDP will configure or reconfigure parameters specified in the configuration bit map according to the new data indicated.

Command Verification:

SPECIFIC CONFIGURATION REPORT

Each parameter in the command shall be reflected under a similar name in the SPECIFIC CONFIGURATION REPORT.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3,4	15 - 0	BIN		N/A	N/A	**CONFIGURATION ITEM BIT MAP** This field identifies whether or not a particular configuration data item is valid. Only items with their corresponding bit set to true in the bit map will be updated.
	0		0 OR 1			1 = SERVICE TYPE
	1		0 OR 1			1 = RANGE CHANNEL FEEDBACK TAPS
	2		0 OR 1			1 = INITIAL A REGISTER VALUE
	3		0 OR 1			1 = OPERATIONAL LIGHT
	4		0 OR 1			1 = SSHF PN RATE
	5		0 OR 1			1 = FORWARD DATA RATE
	6		0 OR 1			1 = SHUTTLE MODE
	7		0 OR 1			1 = MODULATION TYPE
	8		0 OR 1			1 = MODULATION INDEX
	9		0 OR 1			1 = SUBCARRIER FREQUENCY
	10		0 OR 1			1 = SUBCARRIER - TO - DATA RATE RATIO
	11		0 OR 1			1 = GN DATA FORMAT
	12		0 OR 1			1 = IDLE PATTERN ENABLE
	13		0 OR 1			1 = MODULATION ENABLE/DISABLE
	14 - 15					SPARE
5	7 - 0	BIN	1 - 29	N/A	N/A	**SERVICE TYPE** 1 - 19 = RESERVED 20 = KSAF 21 = KSHF 22 = SSAF 23 = SSHF 24 = SPARE 25 = MAF 26 = RESERVED 27 = KSA RANGE ZERO SET 28 = SSA RANGE ZERO SET 29 = MA RANGE ZERO SET

MDP_SPECIFIC_CONFIGURATION_COMMAND (CONT)

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
6	7 - 0	BIN	1 OR 2	N/A	N/A	**SHUTTLE MODE** 1 = MODE 1 2 = MODE 2
7 - 10	31 - 0					**RANGE CHANNEL AND SSHF PN CODE FEEDBACK TAPS**
	20 - 0	OCT	1000000 TO 1777777 (2011 TO 3045 FOR SSHF)	N/A	N/A	TAP VALUES
	31 - 21	BIN	0	N/A	N/A	ZERO PADS
11, 12	15 - 0					**COMMAND CHANNEL PN CODE REGISTER A INITIAL CONDITIONS**
	9 - 0	BIN	0000000001 TO 1111111111	N/A	N/A	10 - BIT REGISTER FILL
	15 - 10	BIN	0	N/A	N/A	ZERO PAD
13	7 - 0	BIN	N/A	N/A	N/A	**OPERATIONAL LIGHT** 1 = ONLINE 2 = STANDBY 3 = MAINTENANCE
14	7 - 0	BIN	N/A	N/A	N/A	**SPARE**
15 - 18	31 - 0	BIN	11.2 M to 11.3 M	chips/s	LSB = 1	**SSHF PN CODE RATE**
19 - 22	31 - 0	BIN	100 to 25,000,000	BPS	LSB = 1	**FORWARD DATA RATE**
23	7 - 0	BIN	1 to 4	N/A	N/A	**MODULATION TYPE** 1 = SN (SUPPRESSED CARRIER) 2 = GN, DIRECT PHASE MODULATION 3 = GN, SUBCARRIER, SINEWAVE 4 = GN, SUBCARRIER, SQUAREWAVE
24	7 - 0	BIN	0.2 to 1.5, OR 0	radians	LSB = 0.1	**MODULATION INDEX FOR GN MODES** (0 = BPSK)
25, 26	15 - 0	BIN	2,000 to 16,000	Hz	1 Hz	**SUBCARRIER FREQUENCY**
27	7 - 0	BIN	2,4,8,16,32,64, 128	N/A	N/A	**SUBCARRIER—TO—DATA RATE RATIO**
28	7 - 0	BIN	1 to 6	N/A	N/A	**GN DATA FORMAT** 1 = NRZ - L 2 = NRZ - M 3 = NRZ - S 4 = BIPhase - L 5 = BIPhase - M 6 = BIPHASE - S
29	7 - 0	BIN	0 OR 1	N/A	N/A	**IDLE PATTERN ENABLE** 1 = IDLE PATTERN ENABLED 0 = IDLE PATTERN DISABLED
30	7 - 0 0	BIN	N/A 0 OR 1	N/A	N/A	**MODULATION ENABLE/DISABLE** 1 = SUBCARRIER MODULATION ENABLED 0 = SUBCARRIER MODULATION DISABLED
	1		0 OR 1			1 = DATA MODULATION ENABLED 0 = DATA MODULATION DISABLED
	2 - 7					SPARES
31, 32	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_COMMON_CONFIGURATION_COMMAND

Description:

Type: Asynchronous

The Common Configuration Command contains configuration parameters which are common with the IR. The MDP reads only the parameters demarcated in the configuration bit map. All others are ignored.

The MDP will configure or reconfigure parameters specified in the configuration bit map according to the new data indicated.

Command Verification:

COMMON CONFIGURATION REPORT
Each parameter in the configuration command is under a similar name in the configuration report.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3 - 6	31 - 0	BIN	N/A	N/A	N/A	**SPARES**
7, 8	15 - 0	BIN		N/A	N/A	**BIT MAP**
	0		0 OR 1			1 = FWD IF OFFSET FREQUENCY
	1		0 OR 1			1 = FWD TRANSLATION FREQ
	2		0 OR 1			1 = PN MODULATION CONFIGURATION
	3		0 OR 1			1 = DOPPLER COMP CONFIGURATION Setting of this parameter during service will cause the MDP return to the configured state. A START SERVICE COMMAND shall be required to start again.
	4		0 OR 1			1 = FWD SWEEP SELECT
	5		0 OR 1			1 = GN FWD SWEEP DURATION
	6		0 OR 1			1 = GN FWD SWEEP RANGE
	7 - 15					SPARES
9 - 12	31 - 0	BIN	+/- 2 MHz	HZ	LSB = 1 Hz	**FORWARD IF OFFSET FREQUENCY, df_F** Specifies fixed offset to apply to 370 MHz for base IF
13 - 16	31 - 0	BIN	1000 MHz to 13500 MHz	HZ	LSB = 1 kHz	**FORWARD TRANSLATION FREQUENCY, f_{tf}** (370 MHz + OFFSET + FWD TRANS = USER RECEIVE FREQUENCY)

MDP_COMMON_CONFIGURATION_COMMAND (CONT)

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
17	7 - 0	BIN	0, 1, OR 3	N/A	N/A	**PN MODULATION CONFIGURATION** 0 = PN MODULATION DISABLED 1 = PN MODULATION ENABLED WITH RANGE CHANNEL ENABLED 2 = NOT USED 3 = PN MODULATION ENABLED WITH RANGE CHANNEL DISABLED
18	7 - 0	BIN				**INITIAL DOPPLER COMPENSATION CONFIGURATION**
	0		0 OR 1			1 = COMPENSATION ENABLED (When MDP is commanded to start service, it will follow the Doppler Comp Profile) 0 = COMPENSATION INHIBITED (MDP will hold a constant frequency)
	1		0 OR 1			1 = FWD PN DOPPLER COMPENSATION ENABLED (SSHF only) 0 = FWD PN DOPPLER COMPENSATION INHIBITED (SSHF only)
	2 - 7					SPARES
19	7 - 0	BIN	1 OR 2	N/A	N/A	**SN/GN FORWARD SWEEP SELECT** 1 = SN SWEEP 2 = GN SWEEP
20	7 - 0	BIN	1 TO 120	SECONDS	LSB = 1	**GN FORWARD SWEEP DURATION**
21, 22	15 - 0	BIN	10 TO 600,000	Hz	LSB = 10	**GN FORWARD SWEEP RANGE**
23 - 24	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_DOWNLOAD_COMMAND

Description:

Type: N/A

Used to notify the MDP that an ephemeris block or firmware download is following. This command must be sent prior to sending an ephemeris data block.

Command Verification:

PERFORMANCE REPORT

Observe EPHEMERIS STATUS for UPDATE COMPLETE after the ephemeris data has been downloaded. The unit has up to ten seconds from receipt of the last data point to complete the processing. This command shall cause the UPDATE COMPLETE parameter to be reset. It shall set upon processing completion.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	N/A	N/A	N/A	**SPARE**
4	7 - 0	BIN	1 TO 2	N/A	N/A	**DOWNLOAD TYPE:** 1 = DOWNLOAD EPHEMERIS 2 = DOWNLOAD FIRMWARE (RESERVED FOR IEC USE.)
5 - 8	31 - 0	BIN	0 - 9606	16 BIT WORDS	1 WORD	**1553 WORD COUNT** If Download type field contains 1 then # of 1553 words of Ephemeris. If 2, # of words of MCP Firmware
9, 10	15 - 0	BIN	0	N/A	N/A	**RESERVED FOR IEC USE**
11, 12	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_EPHEMERIS_DATA_COMMAND

Description:

Provides doppler compensation data to the MDP. The additional tables are provided to show commonality with the IR and PTE only.

The TABLE BIT MAP is used to specify the tables that are to be sent. Tables, if sent, shall be in the order specified by the format. This is a variable length table. If a table is not sent, there shall be no unused bytes inserted in its place. All tables within a download shall have the same length (same # of points). Each data point represents the ephemeris at half second increments. The time represents the time of the first data point.

The DOPPLER COMPENSATION TABLE supplies the delta frequencies that are to be added to the MDP base IF frequency (370 MHz + FWD IF OFFSET FREQ) when doppler compensation is active. This is supplied to the MDP for all services. This table is used by the MDP if and only if doppler compensation is active.

The DOPPLER CORRECTION TABLE is not used by the MDP.

The DELAY TABLE is not used by the MDP.

The TDRS DOPPLER TABLE is not used by the MDP.

Command Verification:

PERFORMANCE REPORT

Observe EPHEMERIS STATUS for UPDATE COMPLETE after the ephemeris data has been downloaded. The unit has up to ten seconds from receipt of the last data point to complete the processing.

Format:

MDP_EPHEMERIS_DATA_COMMAND (CONT)

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	0 - 23	HOURS	LSB = 1	**TIME OF FIRST POINT — HOURS**
4	7 - 0	BIN	0 - 59	MINUTES	LSB = 1	**TIME OF FIRST POINT — MINUTES**
5	7 - 0	BIN	0 - 59	SECONDS	LSB = 1	**TIME OF FIRST POINT — SECONDS**
6	7 - 0					**SPARE**
7,8	15 - 0	BIN	0 - 1200	# POINTS	1	**NUMBER OF POINTS PER TABLE (N)**
9,10	15 - 0					**TABLE SELECT BIT MAP**
	0	BIN	0 OR 1	N/A	N/A	1 = DOPPLER COMP TABLE
	1	BIN	0 OR 1	N/A	N/A	RESERVED (DOPPLER PRE - CORR TABLE)
	2	BIN	0 OR 1	N/A	N/A	RESERVED (DELAY TABLE)
	3	BIN	0 OR 1	N/A	N/A	RESERVED (TDRS DOPPLER TABLE)
	4 - 15	BIN				SPARES
X,X,X,X	31 - 0	BIN	- 560 kHz to +560 kHz	cHz (.01 Hz)	1 cHz	**DOPPLER COMPENSATION TABLE — POINT 1** THRU
	same	same	same	same	same	**POINT N**
	31 - 0					**RESERVED (DOPPLER CORRECTION TABLE)**
	31 - 0					**RESERVED (DELAY TABLE)**
	31 - 0					**RESERVED (TDRS DOPPLER TABLE)**
Y,Y	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

*** N is the number of points per table**

MDP_FORWARD_FREQUENCY_SWEEP_COMMAND

Description:

Type: Synchronous

This command initiates a forward sweep in the MDP.
It is used by the NCC to assist in forward user acquisition if the user state vector is suspect (i.e.near or greater than +/- 9 seconds off in time for S - BAND or +/- 4.5 seconds for K - BAND) or the transponder receiver “best lock” frequency is suspect (i.e. temperature drift considerations).

The MDP will perform the forward sweep by sweeping the carrier frequency from - 3.0940 kHz to + 3.0940 kHz for S - band and from - 30.8490 kHz to +30.8490 kHz for K - band around the current frequency profile over a 120 second period. Upon completion of sweep, the doppler profile will be resumed but offset from the nominal doppler profile in frequency by a forward sweep bias of + 3.0940 kHz for S - band or +30.8490 kHz for K - band. There is no sweep for shuttle users.

The sweep bias added by this command shall be removed by receipt and execution of a MDP_FORWARD_DOPPLER_COMP_CONTROL_CMD, or MDP_START_SERVICE_CMD.

Command Verification:

PERFORMANCE REPORT

The SWEEP IN PROGRESS indicator in the FREQUENCY CONTROL STATUS parameter shall be set in response to a forward sweep, and reset upon its completion.

The SWEEP BIAS STATUS indicator shall reflect the state of the forward bias when execution of this command is complete. The resetting of this bias is discussed in the appropriate commands.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	0 - 23	HOURS	LSB = 1	**EFFECTIVE TIME HOURS**
4	7 - 0	BIN	0 - 59	MINUTES	LSB = 1	**EFFECTIVE TIME MINUTES**
5	7 - 0	BIN	0 - 59	SECONDS	LSB = 1	**EFFECTIVE TIME SECONDS**
6	7 - 0	BIN	0 - 12	N/A	LSB = 1	**NUMBER OF SWEEPS**
7, 8	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_FORWARD_BREAK_LOCK_COMMAND

Description:

Type: Synchronous

This command notifies the MDP to perform a forward break lock. The break lock command causes the MDP to initiate an abrupt frequency change in output frequency. The step size is typically 1 MHz.

Command Verification:

PERFORMANCE REPORT

The BREAK LOCK IN PROGRESS indicator in the FREQUENCY CONTROL STATUS parameter shall be set for the duration of the break lock, and reset upon completion.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	0 - 23	HOURS	LSB = 1	**EFFECTIVE TIME HOURS**
4	7 - 0	BIN	0 - 59	MINUTES	LSB = 1	**EFFECTIVE TIME MINUTES**
5	7 - 0	BIN	0 - 59	SECONDS	LSB = 1	**EFFECTIVE TIME SECONDS**
6	7 - 0	BIN	0 - 255	SEC	1	**DURATION**
7, 8	15 - 0	BIN	$\pm$1 MHz	kHz	LSB = 1 kHz	**STEP SIZE**
9, 10	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_FWD_DOPPLER_COMP_CONTROL_COMMAND

Description:

Type: Synchronous

This command directs the MDP to perform a linear frequency ramp for the duration specified in the duration field, to a target frequency specified by adding the Delta Target Frequency in the command to the current IF frequency at the effective time. At the end of the ramp, the MDP will either return or not return to profile, as specified by the Return To Profile parameter.

Command Verification:

PERFORMANCE REPORT

Upon initiation of the ramp in response to this command, the MDP shall reflect this ramp by setting the CARRIER/PN DOPPLER COMP CONTROL IN PROGRESS indicators in the FREQUENCY CONTROL STATUS PARAMETER. Upon completion of the ramp, the CARRIER/PN CODE RATE COMPENSATION STATUS fields in the FREQUENCY CONTROL STATUS parameter shall be set to either Following Profile or Holding Constant Frequency, as appropriate.

Format:

MDP_FORWARD_DOPPLER_COMP_CONTROL (CONT)

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1 - 2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	0 - 23	HOURS	LSB = 1	**EFFECTIVE TIME HOURS**
4	7 - 0	BIN	0 - 59	MINUTES	LSB = 1	**EFFECTIVE TIME MINUTES**
5	7 - 0	BIN	0 - 59	SECONDS	LSB = 1	**EFFECTIVE TIME SECONDS**
6	7 - 0	BIN				**COMMAND WORD**
	0		0 OR 1	N/A	N/A	1= RAMP CARRIER FREQUENCY
	1		0 OR 1	N/A	N/A	1 = RAMP PN CODE RATE (SSHF ONLY)
	2 - 7					SPARES
7 - 8	15 - 0	BIN	0 to 120 (0 to 10 min)	SECONDS	1 SEC	**DURATION**
9 - 12	31 - 0	BIN	- 2M to +2M	Hz	.01	**DELTA TARGET FREQUENCY**
13	7 - 0					**SPARE**
14	7 - 0	BIN	0 OR 1	N/A	N/A	**RETURN TO PROFILE AFTER ENABLE SWEEP** At the end of the duration of an enable sweep, the use of the ephemeris table is resumed if and only if this parameter is “YES”. 0 = NO 1 = YES
15 - 16	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

MDP_START_SERVICE

Description:

Type: Synchronous

Description: Supplies initial PN epoch time for spread modes and initiates modulation. Start of this command shall reset all forward control commands (such as sweep, doppler control, etc.).

Command Verification:

PERFORMANCE REPORT

Upon activation of the Forward Service, the MDP shall report the OPERATING STATE as IN SERVICE.

Format:

BYTE #	BIT # S	TYPE	RANGE	UNITS	RESOLUTION	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	**START CHECKWORD**
3	7 - 0	BIN	0 - 23	HOURS	LSB = 1	**EFFECTIVE TIME HOURS**
4	7 - 0	BIN	0 - 59	MINUTES	LSB = 1	**EFFECTIVE TIME MINUTES**
5	7 - 0	BIN	0 - 59	SECONDS	LSB = 1	**EFFECTIVE TIME SECONDS**
6	7 - 0	BIN	N/A	N/A	N/A	**SPARE**
7,8	15 - 0	HEX	55AA	N/A	N/A	**END CHECKWORD**

G6.4 MODULATOR/DOPPLER PREDICTOR (MDP) STATUS

SUMMARY OF MODULATOR/DOPPLER PREDICTOR (MDP) STATUS TABLES:

SPECIFIC_CONFIGURATION_REPORT
COMMON_CONFIGURATION_REPORT
TIME_TRANSFER_REPORT
PERFORMANCE_REPORT
EXTENDED_BIT_REPORT

MDP_SPECIFIC_CONFIGURATION_REPORT

Description: Reports configuration of the unit, reflecting the SPECIFIC_ CONFIGURATION_COMMAND.

Format:

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	N/A	**START CHECKWORD**
3,4	15 - 0	BIN	1 - 366	DAYS	LSB = 1	CTFS	**REPORT TIME DAY**
5	7 - 0	BIN	0 - 23	HOURS	LSB = 1	CTFS	**REPORT TIME HOURS**
6	7 - 0	BIN	0 - 59	MINS	LSB = 1	CTFS	**REPORT TIME MINUTES**
7	7 - 0	BIN	0 - 59	SECS	LSB = 1	CTFS	**REPORT TIME SECONDS**
8	7 - 0	BIN	1 - 29	N/A	N/A	N/A	**SERVICE TYPE** 1 - 19 = RESERVED 20 = KSAF 21 = KSHF 22 = SSAF 23 = SSHF 24 = SPARE 25 = MAF 26 = RESERVED 27 = KSA RANGE ZERO SET 28 = SSA RANGE ZERO SET 29 = MA RANGE ZERO SET
9 - 12	31 - 0						**RANGE CHANNEL AND SSHF PN CODE FEEDBACK TAPS**
	20 - 0	OCT	1000000 TO 1777777	(2011 to 3045 FOR SSHF)			Tap values
	31 - 21	BIN	0				Zero pads
13	7 - 0						**COMMAND CH. PN CODE REGISTER A INITIAL CONDITIONS**
	6 - 0	BIN	0000000 TO 1111111	N/A	N/A	N/A	7 bit register fill
	7	BIN	0				Zero pad
14	7 - 0						**SPARE**
15	7 - 0	BIN	1 - 3	N/A	N/A	N/A	**OPERATIONAL LIGHT** 1 = ONLINE 2 = STANDBY 3 = MAINTENANCE
16	7 - 0	BIN	1 - 2	N/A	N/A	N/A	**SHUTTLE MODE** 1 = MODE 1 2 = MODE 2

MDP_SPECIFIC_CONFIGURATION_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
17 - 20	31 - 0	BIN	11.2M TO 11.3 M	chips/s	LSB = 1	N/A	**SSHF PN CODE RATE**
21 - 24	31 - 0	BIN	100 TO 25,000,000	BPS	LSB = 1	N/A	**FORWARD DATA RATE**
25	7 - 0	BIN	1 TO 4	N/A	N/A	N/A	**MODULATION TYPE** 1 = SN (SUPPRESSED CARRIER) 2 = GN, DIRECT PHASE MODULATION 3 = GN, SUBCARRIER, SINEWAVE 4 = GN, SUBCARRIER, SQUAREWAVE
26	7 - 0	BIN	0.2 TO 1.5, OR 0	radians	LSB = 0.1	N/A	**MODULATION INDEX FOR GN MODES** (0 = BPSK)
27, 28	15 - 0	BIN	2,000 TO 16,000	Hz	1 Hz	N/A	**SUBCARRIER FREQUENCY**
29	7 - 0	BIN	2,4,8,16,32, 64,128	N/A	N/A	N/A	**SUBCARRIER—TO—DATA RATE RATIO**
30	7 - 0	BIN	1 TO 6	N/A	N/A	N/A	**GN DATA FORMAT** 1 = NRZ - L 2 = NRZ - M 3 = NRZ - S 4 = BIPhase - L 5 = BIPhase - M 6 = BIPhase - S
31	7 - 0	BIN	0 OR 1	N/A	N/A	N/A	**IDLE PATTERN ENABLE** 1 = IDLE PATTERN ENABLED 0 = IDLE PATTERN DISABLED
32	7 - 0	BIN	N/A	N/A	N/A	N/A	**MODULATION ENABLE/ DISABLE**
	0		0 OR 1				1 = SUBCARRIER MODULATION ENABLED 0 = SUBCARRIER MODULATION DISABLED
	1		0 OR 1				1 = DATA MODULATION ENABLED 0 = DATA MODULATION DISABLED
	2 - 7						SPARES
33, 34	15 - 0	HEX	55AA	N/A	N/A	N/A	**END CHECKWORD**

MDP_COMMON_CONFIGURATION_REPORT

Description: Reports configuration of the unit reflecting the COMMON_ CONFIGURATION_COMMAND.

Format:

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	N/A	**START CHECKWORD**
3,4	15 - 0	BIN	1 - 366	DAYS	LSB = 1	CTFS	**REPORT TIME DAY**
5	7 - 0	BIN	0 - 23	HOURS	LSB = 1	CTFS	**REPORT TIME HOURS**
6	7 - 0	BIN	0 - 59	MINS	LSB = 1	CTFS	**REPORT TIME MINUTES**
7	7 - 0	BIN	0 - 59	SECS	LSB = 1	CTFS	**REPORT TIME SECONDS**
8	7 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
9	7 - 0	BIN	0, 1, OR 3	N/A	N/A	N/A	**PN MODULATION CONFIGURATION** 0 = PN MODULATION DISABLED 1 = PN MODULATION ENABLED WITH RANGE CHANNEL ENABLED 2 = NOT USED 3 = PN MODULATION ENABLED WITH RANGE CHANNEL DISABLED
10	7 - 0	BIN					**INITIAL DOPPLER COMPEN—SATION CONFIGURATION**
	0		0 OR 1	N/A	N/A	N/A	1 = CARRIER DOPPLER COMPENSATION ENABLED
	1		0 OR 1	N/A	N/A	N/A	1 = PN DOPPLER COMPEN - SATION ENABLED (SSHF ONLY)
	2 - 7						SPARES
11 - 14	31 - 0	BIN	- 2MHz TO + 2 MHz	HZ	LSB = 1 Hz	N/A	**FORWARD IF OFFSET FREQ, df_F** Delta Offset from 370 MHz
15 - 18	31 - 0	BIN	1000 MHz TO 13500 MHz	HZ	LSB=1 kHz	N/A	**FORWARD TRANSLATION FREQUENCY, f_{tf}**
19	7 - 0	BIN	1 OR 2	N/A	N/A	N/A	**SN/GN FORWARD SWEEP SELECT** 1 = SN SWEEP 2 = GN SWEEP
20	7 - 0	BIN	1 TO 120	seconds	LSB = 1	N/A	**FORWARD SWEEP DURATION**
21, 22	15 - 0	BIN	10 TO 600,000	Hz	LSB = 10	N/A	**FORWARD SWEEP RANGE**
23 - 24	15 - 0	HEX	55AA	N/A	N/A	N/A	**END CHECKWORD**

MDP_TIME_TRANSFER_REPORT

Description: Provides time transfer measurement for tracking services.

Format:

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	N/A	**START CHECKWORD**
3,4	15 - 0	BIN	1 - 366	DAYS	LSB = 1	CTFS	**REPORT TIME DAY**
5	7 - 0	BIN	0 - 23	HOURS	LSB = 1	CTFS	**REPORT TIME HOURS**
6	7 - 0	BIN	0 - 59	MINS	LSB = 1	CTFS	**REPORT TIME MINUTES**
7	7 - 0	BIN	0 - 59	SECS	LSB = 1	CTFS	**REPORT TIME SECONDS**
8	7 - 0						**SPARE**
9 - 12	31 - 0	BIN	0 TO 1 SEC	NSEC	LSB = 100 NSEC	10 nSEC systematic	**MEASUREMENT OF FIRST EPOCH RELATIVE TO PREVIOUS 1 PPS PULSE**
13, 14	15 - 0	HEX	55AA	N/A	N/A	N/A	**END CHECKWORD**

MDP_PERFORMANCE_REPORT

Description: Provides performance status.

Format:

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
1,2	15 - 0	HEX	AA55	N/A	N/A	N/A	**START CHECKWORD**
3,4	15 - 0	BIN	1 - 366	DAYS	LSB = 1	CTFS	**REPORT TIME DAY**
5	7 - 0	BIN	0 - 23	HOURS	LSB = 1	CTFS	**REPORT TIME HOURS**
6	7 - 0	BIN	0 - 59	MINS	LSB = 1	CTFS	**REPORT TIME MINUTES**
7	7 - 0	BIN	0 - 59	SECS	LSB = 1	CTFS	**REPORT TIME SECONDS**
8	7 - 0	BIN	0 OR 1	N/A	N/A	N/A	**ENCODER LOCK STATUS** 1 = CLOCK LOCKED This lock is integrated status over the 1 second interval.
9 - 12	31 - 0	BIN					**COMMANDS NOT EXECUTED MAP** Indicates commands not executed at specified time of execution that were suppose to execute in the previous second.
	0						RESERVED
	1		0 OR 1	N/A	N/A	N/A	SET STATE
	2		0 OR 1	N/A	N/A	N/A	COMMON CONFIGURATION
	3						RESERVED
	4		0 OR 1	N/A	N/A	N/A	SPECIFIC CONFIGURATION
	5		0 OR 1	N/A	N/A	N/A	RESERVED
	6		0 OR 1	N/A	N/A	N/A	FWD BREAK LOCK
	7		0 OR 1	N/A	N/A	N/A	DOWNLOAD
	8		0 OR 1	N/A	N/A	N/A	FORWARD FREQUENCY SWEEP
	9						RESERVED
	10		0 OR 1	N/A	N/A	N/A	START SERVICE
	11		0 OR 1	N/A	N/A	N/A	FWD DOPPLER COMP CONTROL
	12						RESERVED
	13						RESERVED
	14						RESERVED
	15						RESERVED
	16						RESERVED
	17						RESERVED
	18						RESERVED
	19						RESERVED
	20		0 OR 1	N/A	N/A	N/A	EPHEMERIS DATA
	21 - 31						RESERVED

MDP_PERFORMANCE_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
13 - 16	31 - 0	BIN	(TBD)	(TBD)	(TBD)	(TBD)	**COMMANDS NOT ACCEPTED MAP** Commands which were immediately rejected within the past second.
	0						RESERVED
	1		0 OR 1	N/A	N/A	N/A	SET STATE
	2		0 OR 1	N/A	N/A	N/A	COMMON CONFIGURATION
	3						RESERVED
	4		0 OR 1	N/A	N/A	N/A	SPECIFIC CONFIGURATION
	5						RESERVED
	6		0 OR 1	N/A	N/A	N/A	FWD BREAK LOCK
	7		0 OR 1	N/A	N/A	N/A	DOWNLOAD
	8		0 OR 1	N/A	N/A	N/A	FORWARD FREQUENCY SWEEP
	9						RESERVED
	10		0 OR 1	N/A	N/A	N/A	START SERVICE
	11		0 OR 1	N/A	N/A	N/A	FWD DOPPLER COMP CONTROL
	12						RESERVED
	13						RESERVED
	14						RESERVED
	15						RESERVED
	16						RESERVED
	17						RESERVED
	18						RESERVED
	19						RESERVED
	20		0 OR 1	N/A	N/A	N/A	EPHEMERIS DATA
	21 - 31						RESERVED
17	7 - 0	BIN	0 - 2	N/A	N/A	N/A	**COMMAND NOT EXECUTED ERROR CODE** REPORTS REASON WHY THE LAST COMMAND NOT EXECUTED WAS NOT EXECUTED. 0 = NO ERROR 1 = ILLEGAL STATE The commands effective time was during a state not allowed in accordance with the state table. 2 = ALREADY IN PROGRESS A commands effective time was during the execution time of the same command sent previously.

MDP_PERFORMANCE_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
18	7 - 0	BIN	0 - 8	N/A	N/A	N/A	**COMMAND NOT ACCEPTED ERROR CODE** REPORTS REASON WHY THE LAST COMMAND NOT ACCEPTED WAS NOT ACCEPTED 0 = NO ERROR 1 = INSUFFICIENT NOTIFICATION Synchronous command received too close to effective time 2 = EFFECTIVE TIME IN PAST Synchronous command was received after effective time.. 3 = INVALID SUBADDRESS 4 = INCORRECT COMMAND SIZE 5 = INCOMPLETE CONFIGURATION (Indicates that the configuration data needed was not supplied to execute the last command) 6 = EPHEMERIS TABLE CONTAINS MORE THAN 10 MINUTES DATA 7 = EFFECTIVE TIME TOO FAR IN FUTURE 8 = EPHEMERIS PROTOCOL ERROR
19	7 - 0	N/A	N/A	N/A	N/A	N/A	SPARE
20	7 - 0	BIN	1 TO 4	N/A	N/A	N/A	**OPERATING STATE** 1 = STANDBY 2 = EXTENDED BIT 3 = CONFIGURED 4 = CONFIGURATION IN PROG 5 = IN SERVICE
21 - 24	31 - 0	BIN	- 2M to +2M Hz		1 cHz (0.01 Hz)	1 cHz (0.01 Hz)	**DELTA IF FREQUENCY** TRANSMIT - 370 MHz
25	7 - 0 0 1 2 - 7	BIN	0 OR 1	N/A	N/A	N/A	**EPHEMERIS STATUS** SPARE 1 = UPDATE COMPLETE SPARES
26	7 - 0	BIN	0 TO 256	N/A	LSB = 1	N/A	SWEEP COUNT (Number of sweeps since last sweep command)

MDP_PERFORMANCE_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
27	7 - 0	BIN					**FREQUENCY CONTROL STATUS**
	0		0 OR 1	N/A	N/A	N/A	1 = BREAK LOCK IN PROGRESS
	1		0 OR 1	N/A	N/A	N/A	1 = SWEEP IN PROGRESS
	2		0 OR 1	N/A	N/A	N/A	1 = CARRIER DOPPLER COMP CONTROL IN PROGRESS
	3		0 OR 1	N/A	N/A	N/A	1 = PN DOPPLER COMP CONTROL IN PROGRESS (SSHF ONLY)
	4		0 OR 1	N/A	N/A	N/A	CARRIER COMPENSATION STATUS 0 = HOLDING CONSTANT FREQUENCY 1 = FOLLOWING PROFILE
	5		0 OR 1	N/A	N/A	N/A	PN CODE RATE COMPENSA - TION STATUS (SSHF ONLY) 0 = HOLDING CONSTANT FREQUENCY 1 = FOLLOWING PROFILE
	6		0 OR 1	N/A	N/A	N/A	SWEEP BIAS STATUS 0 = BIAS OFF 1 = BIAS ON
	7						SPARE
28	7 - 0	BIN	0 OR 1	N/A	N/A	N/A	**INPUT DATA PRESENCE** 1 = DATA PRESENT
29 - 32	31 - 0	BIN	N/A	Chips	$\frac{M}{N \cdot P400}$*	N/A	**PN CODE STATE (MSB)**
33 - 36	31 - 0	BIN	N/A	Chips	$\frac{M}{N \cdot P400}$*	N/A	**PN CODE STATE (LSB)**

*Where M=31, N=96, and P=221 for SSA/MA Service Types
M=31, N=96, and P=1469 for KSA Service Types

Value of PN code state is modulo code length.

MDP_PERFORMANCE_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
37 - 40	31 - 0	BIN	0 OR 1 PER BIT	N/A	N/A	N/A	**CONFIDENCE TEST RESULTS BY LRU** Reports status of an LRU as a result of confidence testing. Refer to G3.2.5 for applicable LRUs.
	0		0 OR 1				1 = MCP LRU SUSPECT
	1		0 OR 1				1 = DCEC LRU SUSPECT
	2		0 OR 1				1 = TIME LRU SUSPECT
	3		0 OR 1				1 = SYNTH LRU SUSPECT
	4		0 OR 1				1 = FMOD LRU SUSPECT
	5		0 OR 1				1 = 5V (PS1 / PS2) LRU SUSPECT
	6		0 OR 1				1 = RF5V (PS1) LRU SUSPECT
	7		0 OR 1				1 = 12 V (PS2) LRU SUSPECT
	8		0 OR 1				1 = 15V (PS1) LRU SUSPECT
	9		0 OR 1				1 = HIGH UNIT TEMPERATURE
	10		0 OR 1				1 = GMOD LRU SUSPECT
	11 - 29		0 OR 1				SPARES
	30		0 OR 1				1 = TEST COMPLETE
	31		0 OR 1				1 = TEST FAILED
41 - 44	15 - 0	BIN	0 OR 1 PER BIT	N/A	N/A	N/A	**ONLINE BIT STATUS BY LRU** Reports status of an LRU as a result of Online BIT. Refer to G3.2.5 for applicable LRUs.
	0		0 OR 1				1 = MCP LRU SUSPECT
	1		0 OR 1				1 = DCEC LRU SUSPECT
	2		0 OR 1				1 = TIME LRU SUSPECT
	3		0 OR 1				1 = SYNTH LRU SUSPECT
	4		0 OR 1				1 = FMOD LRU SUSPECT
	5		0 OR 1				1 = 5V (PS1 / PS2) LRU SUSPECT
	6		0 OR 1				1 = RF5V (PS1) LRU SUSPECT
	7		0 OR 1				1 = 12 V (PS2) LRU SUSPECT
	8		0 OR 1				1 = 15V (PS1) LRU SUSPECT
	9		0 OR 1				1 = HIGH UNIT TEMPERATURE
	10		0 OR 1				1 = GMOD LRU SUSPECT
	11 - 29		0 OR 1				SPARES
	30		0 OR 1				1 = ON - LINE STATUS VALID
	31		0 OR 1				1 = TEST FAILED
45	7 - 0	BIN	0 OR 1	N/A	N/A	N/A	**LOCAL / REMOTE** 0 = REMOTE 1 = LOCAL
46	7 - 0	N/A	N/A	N/A	N/A	N/A	**SPARE**
47 - 48	15 - 0	HEX	55AA	N/A	N/A	N/A	**END CHECKWORD**

MDP_EXTENDED_BIT_REPORT

Description: Reports results of Extended BIT. Specified as LRUs failed by test. Refer to G3.2.5 for Extended BIT descriptions, including LRUs used in each test.

Format:

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
1, 2	15 - 0	HEX	AA55	N/A	N/A	N/A	**START CHECKWORD**
3, 4	15 - 0	BIN	1 - 366	DAYS	LSB = 1	CTFS	**EXTENDED BIT COMPLETION TIME DAY**
5	7 - 0	BIN	0 - 23	HOURS	LSB = 1	CTFS	**EXTENDED BIT COMPLETION TIME HOURS**
6	7 - 0	BIN	0 - 59	MINS	LSB = 1	CTFS	**EXTENDED BIT COMPLETION TIME MINUTES**
7	7 - 0	BIN	0 - 59	SECS	LSB = 1	CTFS	**EXTENDED BIT COMPLETION TIME SECONDS**
8	7 - 0						**SPARE**
9 - 12	31 - 0	BIN					**TEST RESULTS** Reports LRUs suspect as a result of extended BIT.
	0		0 OR 1	N/A	N/A	N/A	1 = MCP LRU SUSPECT
	1		0 OR 1	N/A	N/A	N/A	1 = DCEC LRU SUSPECT
	2		0 OR 1	N/A	N/A	N/A	1 = TIME LRU SUSPECT
	3		0 OR 1	N/A	N/A	N/A	1 = SYNTH LRU SUSPECT
	4		0 OR 1	N/A	N/A	N/A	1 = FMOD LRU SUSPECT
	5		0 OR 1	N/A	N/A	N/A	1 = 5V (PS1/PS2) LRUs SUSPECT
	6		0 OR 1	N/A	N/A	N/A	1 = RF5V (PS1) LRU SUSPECT
	7		0 OR 1	N/A	N/A	N/A	1 = 12 V (PS2) LRU SUSPECT
	8		0 OR 1	N/A	N/A	N/A	1 = 15V (PS1) LRU SUSPECT
	9		0 OR 1	N/A	N/A	N/A	1 = HIGH UNIT TEMPERATURE
	10		0 OR 1	N/A	N/A	NA	1 = GMOD LRU SUSPECT
	11 - 29		0 OR 1	N/A	N/A	N/A	SPARES
	30		0 OR 1	N/A	N/A	N/A	1 = TEST COMPLETE
	31		0 OR 1	N/A	N/A	N/A	1 = TEST FAILED
13 - 16	31 - 0	BIN	0 OR 1 PER BIT	N/A	N/A	N/A	**VME TEST RESULTS BY LRU** Reports LRU suspects as a result of the VME test.

(Refer to MCP TEST RESULTS BY LRU for LRU bit map)

17 - 20	31 - 0	BIN	0 OR 1 PER BIT	N/A	N/A	N/A	**TIME TEST RESULTS BY LRU** Reports LRU suspects as a result of the TIME test.

(Refer to MCP TEST RESULTS BY LRU for LRU bit map)

21 - 24	31 - 0	BIN	0 OR 1 PER BIT	N/A	N/A	N/A	**DCEC TEST RESULTS BY LRU** Reports LRU suspects as a result of the DCEC test.

(Refer to MCP TEST RESULTS BY LRU for LRU bit map)

MDP_EXTENDED_BIT_REPORT (CONT)

BYTE #	BIT #S	TYPE	RANGE	UNITS	RESOLUTION	ACCURACY	DESCRIPTION
25 - 28	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
29 - 32	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
33 - 36	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
37 - 40	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
41 - 44	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
45 - 48	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
49 - 52	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
53 - 56	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
57 - 60	31 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
61 - 62	15 - 0	BIN	N/A	N/A	N/A	N/A	**SPARE**
63 - 64	15 - 0	HEX	55AA	N/A	N/A	N/A	**END CHECKWORD**

SECTION G7
END—TO—END COMMUNICATIONS CONTROL LEVEL

G7.1 GENERAL

This section describes the interactions of the End - to - End Communications Control Level of the MDP - SSC/ADPE interface (interaction 3 of Figure G4 - 1).

G7.2 BLOCKING

Data shall be blocked in an even number byte format. No command or report shall contain more than 64 bytes, so that it will fit into a single 1553 transfer. Each command and report shall begin with a START CHECKWORD of AA55 HEX, and end with an END CHECKWORD of 55AA HEX. Since each command is identified by its subaddress location in the IR, no command ID need be contained within the End - to - End data message.

G7.3 MDP ILLEGAL COMMAND REPORTING

G7.3.1 SYNCHRONOUS COMMANDS

G7.3.1.1 Not Accepted

Synchronous commands shall be rejected via the COMMAND NOT ACCEPTED parameter in the PERFORMANCE REPORT if:

a. The command is received with insufficient setup time (insufficient notification) as specified in Table G5 - 1.

b. The command is received more than 1 hour in advance of the effective time.

c. The command contains an effective time in the past.

d. The command was received in an invalid subaddress

e. The command contained an incorrect block size (see blocking)

f. There was incomplete configuration data provided to execute that command.

G7.3.1.2 Not Executed

Synchronous commands shall be rejected via the COMMAND NOT EXECUTED parameter in the PERFORMANCE REPORT if:

a. The command ’s effective time occurred during an unallowed state as specified by the MDP COMMAND STATE TABLE, Table G5 - 2.

b. Command execution of that command is already in progress at the effective time of the new command. Execution times are specified in Table G5 - 1.

Should the time between receiving commands of the same type be less than the setup time, the unit shall NOT lockup or malfunction. The unit may, however, overwrite the previous command. This shall not be reported.

G7.3.2 ASYNCHRONOUS COMMANDS

Asynchronous commands shall be rejected via the COMMAND NOT ACCEPTED or COMMAND NOT EXECUTED parameter in the PERFORMANCE REPORT if:

a. the command was received during an invalid state (Refer to Table G5 - 2 for valid states).

b. the command was received in an invalid subaddress

c. the command contained an incorrect block size (see to blocking)

d. there was incomplete configuration data provided to execute that command.

e. ephemeris protocol error

f. incorrect ephemeris table size

G7.3.3 INVALID COMMAND PARAMETERS

Invalid Command Parameters (Out - of - Range value or undefined option selection) shall not cause a command to be rejected, nor shall it cause a unit malfunction. Instead, the command shall be executed using default parameter values for each invalid parameter received.

G7.4 INVALID REPORT TIME TAGS

In the case where the report time tags cease to increment (except EXTENDED BIT REPORT), the ADPE shall assume after two successive time tag failures, that the MDP has had a CPU failure. The ADPE shall initiate a failover in response to this error.

SECTION G8
NETWORK/TRANSPORT CONTROL LEVEL

G8.1 GENERAL

This section describes the Network / Transport Control Level interactions of the MDP - SSC/ ADPE interface: MDP - SSC and SSC - ADPE (interactions 4 and 5 of Figure G4 - 1).

G8.2 MODULATOR DOPPLER PREDICTOR — SUBSYSTEM CONTROLLER

G8.2.1 DATA BLOCK/BYTE MAP

All message formats (commands and status) are defined in bytes. The MSB is transmitted first in accordance with MIL - STD - 1553B. The message format of the bytes is such that the first to last parameter and the MSB to LSB is in the BYTE order of 1 to N respective. The mapping of bytes #'s to 1553 words is shown in Figure G8 - 1.

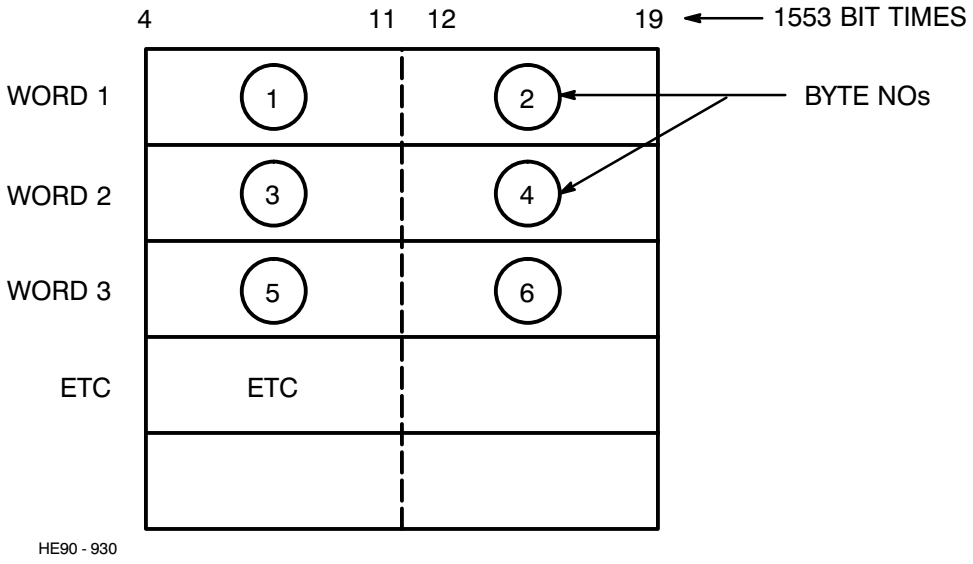

Figure G8—1. Data Transfers

As this is the exact blocking of the data being transmitted and received by the ADPE (excluding the applications header defined in HE - 06 - 1), the messages to and from the MDP from the SSC shall be a direct pass through. Table G8 - 1 shows the MDP command message block sizes. Table G8 - 2 shows the MDP report message block sizes.

As this is the exact format of the data block being transmitted an received by the ADPE, the messages to and from the MDP from the SSC shall be a direct pass through.

TABLE G8—1. MDP COMMAND MESSAGE BLOCK SIZES

COMMAND	BLOCK SIZE (# 1553 WORDS)
SET STATE	4
COMMON CONFIGURE	10
SPECIFIC CONFIGURE	11
START SERVICE	4
FORWARD BREAK LOCK	5
DOWNLOAD (EPHEMERIS | FIRMWARE)	6
FORWARD FREQUENCY SWEEP	4
FORWARD DOPPLER COMP CONTROL	8
EPHEMERIS DATA BLOCKS	6 + (# points x # tables x 2) Max # 1553 Words: 9606

TABLE G8—2. MDP REPORT MESSAGE BLOCK SIZES

REPORT	BLOCK SIZE (# 1553 WORDS)
COMMON CONFIGURATION REPORT	10
SPECIFIC CONFIGURATION REPORT	13
TIME TRANSFER REPORT	7
PERFORMANCE REPORT	24
EXTENDED BIT REPORT	32

G8.2.2 1553 SUBADDRESSES

Subaddress values 0 or 31 shall indicate the presence of a mode code command in the Data Word Count/Mode Code field of the command word. Subaddress values 1 through 29 shall be available to identify Command and Report block messages, as described in the Commands and Reports paragraphs. The presence of an unused subaddress value shall cause the command word to be considered illegal. Illegal commands shall be processed as described in the Illegal Command Word paragraph.

G8.2.3 COMMAND SUBADDRESS IDENTIFICATION

Commands shall be identified by means of uniquely assigned MIL - STD - 1553 subaddresses, as per the Command Message Subaddress, Table G8 - 3. The remote terminals shall use the subaddress value within the received command word as an index to store each received message into a dedicated message buffer.

TABLE G8—3. COMMAND MESSAGE SUBADDRESSES

COMMAND	SUBADDRESS		
	IR	MDP	PTE
SET STATE	1	1	1
COMMON CONFIGURE (IR / MDP / PTE DEMOD)	2	2	2
SPECIFIC CONFIGURE (IR / PTE MOD)	3	N/A	3
SPECIFIC CONFIGURE (MDP / PTE DEMOD)	N/A	4	4
COLD START	5	N/A	N/A
FORWARD BREAK LOCK	6	6	N/A
DOWNLOAD (EPHEMERIS | FIRMWARE)	7	7	7
FORWARD FREQUENCY SWEEP	8	8	N/A
START ACQUISITION	9	N/A	9
START SERVICE	N/A	10	10
FORWARD DOPPLER COMP CONTROL	11	11	N/A
START FWD BER TEST	N/A	N/A	12
START RTN BER TEST	N/A	N/A	13
START FORWARD MODEL	14	N/A	14
MEASURE TIME INTERVAL	N/A	N/A	15
ZERO DOPPLER COUNT	16	N/A	N/A
EXPANDED FREQUENCY SEARCH	17	N/A	N/A
BURN ALERT	18	N/A	N/A
GENERAL CONFIGURE (PTE)	N/A	N/A	18
RANGE CHANNEL REACQUISITION	N/A	N/A	19
DOWNLOAD DATA BLOCKS	20 - 29		
RESERVED (DATA WRAP - AROUND)	30		
MODE CODE COMMANDS	0,31		

The subaddresses of the MIL - STD - 1553 messages comprising the download Ephemeris data block shall sequence through values of 20 and 29, as required. The first message of a download data block shall have a subaddress of 20. the Download Command shall specify the download type (Ephemeris or Firmware) and word size of the ensuing download data block. Other Commands may be interspersed with the download data block messages. If the word size of the data block contains more words than can fit in subaddresses 20 - 29, then the block shall repeat subaddresses 20 through 29 sequentially.

G8.2.4 REPORT SUBADDRESS IDENTIFICATION

Reports shall be identified by means of uniquely assigned MIL - STD - 1553 subaddresses, as per the Report Message Subaddresses, Table G8 - 4. The SSC transmit command shall contain a subaddress that the remote terminals shall use as an index to select the desired Report message for transmission to the SSC.

G8.2.5 MDP POWER—UP INITIALIZATION

Upon power - up or reset, the MDP will enter its Confidence Test In Progress State. During this state, there shall be a maximum of 10 seconds, where the MDP does not respond over the 1553 bus.

TABLE G8—4. REPORT MESSAGE SUBADDRESSES

REPORT	SUBADDRESS		
	IR	MDP	PTE
TRACKING/TIME TRANSFER	1	1	N/A
SPECIFIC CONFIGURATION, MDP/PTE MOD	N/A	2	2
SPECIFIC CONFIGURATION, IR/PTE DEMOD	3	N/A	3
PERFORMANCE, IR/PTE DEMOD	4	N/A	4
PERFORMANCE, MDP/PTE MOD	N/A	5	5
EXTENDED BIT	6	6	6
PTE GENERAL REPORT	N/A	N/A	7
BER MEASUREMENTS	N/A	N/A	8
COMMON CONFIGURATION, MDP	N/A	9	N/A
COMMON CONFIGURATION, IR	10	N/A	N/A
SPARE	11 - 29		
RESERVED (DATA WRAP - AROUND)	30		

G8.2.6 MESSAGE ERROR HANDLING

In response to a the 1553 message error flag in the 1553 status word, the SSC shall retransmit the message to the MDP one time. Should a second message error occur, the SSC shall report the error to the ADPE as described in paragraph G8.3.3.

G8.2.7 REMOTE TERMINAL ADDRESS

The MDP RT address shall be determined via an external harness cable.

G8.3 SUBSYSTEM CONTROLLER — ADPE

G8.3.1 DATA BLOCK/BYTE MAP

The MDP message data shall be transferred between the SSC and the ADPE as per paragraph G8.2.1.

ADPE applications header (as per HE - 06 - 1) shall be stripped off of commands prior to sending to the MDP. Status report blocks, when reported to the ADPE, shall be provided in a status table as described in HE - 06 - 1 paragraphs G6.1.1, G6.2.2, and G6.3.1 for SSA, MA, and KSA respectively.

G8.3.2 MDP UNIT COMMAND ID PROCESSING

A unit command ID shall be passed to the SSC as part of the application header which shall indicate which command is being sent on to the MDP. The SSC shall use this ID to determine the subaddress on the MDP/SSC 1553 bus on which the command shall be transmitted. The unit command ID for each command shall be as defined in paragraph 6.1.1.13 of HE - 06 - 1. The mapping of command to subaddress is show in Table G8 - 3.

G8.3.3 SSC — MDP 1553 BUS MESSAGE ERROR REPORTING

Lack of MDP bus response (due to problem or power - up) or receipt of message error after retry shall be reported to the ADPE via a once per second SSC status table, as defined in the Format Control Level of HE - 06 - 1, paragraphs G6.1.1.1, G6.2.1.1, and G6.3.1.1.

SECTION G9
LINK CONTROL LEVEL

G9.1 GENERAL

This section describes the Link Control Level interactions of the MDP - SSC interface (interaction 6 of Figure G4 - 1).

G9.2 MODE CODES

Nine mode code commands shall be provided to support interface diagnostic procedures and dual redundant support. Table G9 - 1 lists the supported mode codes.The mode code command processing shall conform to MIL - STD - 1553, as described below. The mode code command rate shall not exceed one per second.

TABLE G9—1. SUPPORTED MODE CODES

COMMAND	MODE CODES (BITS 15 - 19)
TRANSMIT STATUS WORD	00010 (2)
INITIATE SELF TEST	00011 (3)
TRANSMITTER SHUTDOWN	00100 (4)
OVERRIDE TRANMSITTER SHUTDOWN	00101 (5)
INHIBIT TERMINAL FLAG	00110 (6)
OVERRIDE INHIBIT TERMINAL FLAG	00111 (7)
RESET REMOTE TERMINAL	01000 (8)
TRANSMIT LAST COMMAND	10010 (18)
TRANSMIT BIT WORD	10011 (19)

The Transmit Bit command shall cause the remote terminal to transmit its status word followed by a single data word containing the remote terminal's BIT data. The data word, containing the remote terminal BIT data, shall not be altered by the reception of a transmit last command or a transmit status word mode code. The next status word access shall reflect any errors in BIT word transmission. The format of the remote terminal's BIT Word is shown in Table G9 - 2.

G9.3 1553 STATUS WORD

The supported status bits are listed in Table G9 - 3. The other status bits shall be spared, and their value not guaranteed.

TABLE G9—2. REMOTE TERMINAL BIT WORD FORMAT

BIT	MEANING
15 (MSB)	LOGIC “0”
14	LOGIC “0”
13	CHANNEL B TRANSMITTER TIMEOUT
12	CHANNEL A TRANSMITTER TIMEOUT
11	CHANNEL B LOOP TEST FAILURE
10	CHANNEL A LOOP TEST FAILURE
9	CHANNEL B TRANSMITTER SHUTDOWN
8	CHANNEL A TRANSMITTER SHUTDOWN
7	NON - MODE BROADCAST COMMAND TO TRANSMIT
6	MESSAGE ABORT - HIGH WORD COUNT
5	MESSAGE ABORT - LOW WORD COUNT
4	ILLEGAL MODE CODE OR ILLEGAL BRDCST W/ MODE CODE
3	MODE CODE OR TRANSMIT/RECEIVE BIT ERROR
2	A/B LOOP TEST FAILURE
1	HANDSHAKE FAILURE
0 (LSB)	A/B TRANSMITTER FAILURE

TABLE G9—3. SUPPORTED STATUS BITS

STATUS BIT FUNCTION	STATUS BIT — TIMES
Message Error	9
Terminal Flag	19

G9.3.1 MESSAGE ERROR

The Message Error bit shall be set as per the 1553B standard to indicate that the preceding received bus controller message was in error. The validation criteria shall include those for invalid messages (data and command word validation, transmission continuity, and word count verification).

G9.3.2 TERMINAL FLAG

The Terminal Flag bit shall be set by the remote terminal when it detects a bit error during data transmission. This shall be accomplished by means of its loop - back data monitoring feature. During data transmission, the last word of each MIL - STD - 1553 message transmitted from the remote terminal shall be verified. The last word of each message shall be locally looped - back through the receive circuitry of the remote terminal. The transmitted and ’received’ copies of the

message's last word shall be bit - by - bit compared to detect any transmission errors. If a transmission error is detected, the remote terminal shall set the Terminal Flag bit in its status word.

G9.3.3 1553 RECEPTION FAILURES

The Remote Terminal data reception of Invalid Command Word and Invalid Data Receptions shall be handled as per the 1553B standard.

SECTION G10
PHYSICAL LEVEL

The physical interface between the SSCs and the MDPs for each service shall be as defined in paragraphs of HE - 06 - 2 listed below.

IR HWCI	SSC HWCI	HE06 - 2 Section
SSA EQUIPMENT	SSA CONTROL	23, 27, 36
MA RCVR/XMIT	MA CONTROL	23, 27, 36
KSA LOW DATA RATE	KSA CONTROL	23, 26, 36